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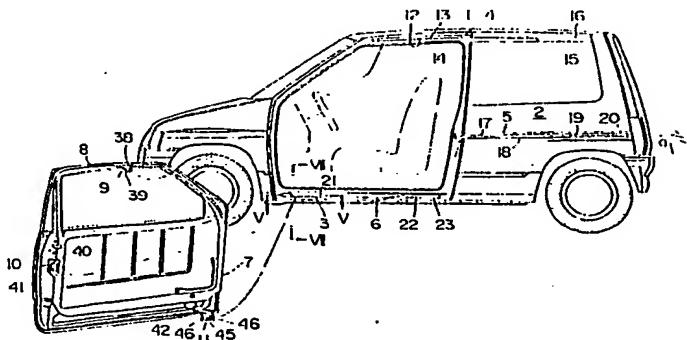
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### ㉒ Vehicles provided with slide door.

㉓ The present invention relates to a structure of a lower rail (22) for guiding a slide door (7) and a mounting structure to a side sill. A part of the side sill (3) is projecting externally and covers the upper part of the lower rail (22). The top end portion of the lower rail (22) is bent inside the side sill (3) and is fastened to the rail housing box (34) and the floor side panel (26). The roller supporting member (44) for supporting the roller (45) and the arm (39) being fastened to the door are connected by means of a pin (43). A groove (34b) is formed on the bottom wall (34a) of the rail housing box (34) corresponding to the moving range of the pin, and the height of the rail housing box is reduced by letting the above-mentioned pin face inside the groove. And, both the stopper (48) at the rear end portion of the rail and the leaf spring (47) are formed independently each other, then the stopper is inserted into an opening (51) of a rail and the leaf spring is assembled to the rail from above the rail so that the both may be assembled with one screw (52) from above the rail.

FIG. I



## Description

## Vehicles Provided With Slid Door

## 2. FIELD OF THE INVENTION AND RELATED ART STATEMENT

The present invention relates to a vehicles equipped with a slide door, more particularly, the invention relates to a lower rail for supporting guide a door and for guiding the door backwardly along a side body.

In the case of a conventional type vehicle slide door provided with an upper rail, a center rail, and a lower rail are arranged for the roof panel, rear quarter panel, side sill, etc., all of which compose the side body of the vehicle, thereby the door can be guided along the side body.

Here, the lower rail is fixed in the state where it is exposed to the outer wall of the side sill.

However, since the side sill is located at the lower part of the door opening region, and is positioned outside of the weather strip, the side sill serves as the place to collect rainwater flowing down along the weather strip. On account of this, in the structure where the lower rail is assembled projecting from the said sill, the rainwater penetrates the side sill through the hole of mounting bolts, etc., leaving the problem unsolved, i.e., the lower rail itself is prone to generation of rust.

Furthermore, the lower rail cannot help being positioned crossing the passengers' stepping region, and consequently in its exposed state, there is a fear of its being damaged or deformed due to external forces of stepping foot, etc., and accordingly the lower rail is prone to fouling.

Here, the lower rail, in order to shut the door, has the top end being formed to be bent inwardly. Subsequently, opening region is formed at the side sill so that the top end bent region of the lower rail may come in. In the opening region the housing box is fixed by welding at the side sill opening region for housing and supporting the top-end bent region of the lower rail and for preventing rainwater, etc., from penetrating the side sill.

For assembling of the lower rail, it is carried out by means of the side wall of the side sill at the linear part thereof and by the side wall of the housing box as well as by respective mounting bolts at the top-end bent region. And, taking into account the mounting operability, operating holes are provided at the floor side panels.

Here, the vehicle having slide door type, when the said door is shut, a load thereof concentrates on the top-end bent region of the lower rail, moreover, vibration load is also applied during travel. Accordingly, enough mounting strength thereof and rigidity in the mounting vicinity thereof are required.

However, in the case of the mounting structure of the above-mentioned lower rail, there is some uneasiness in terms of strength because the top-end bent region of the lower rail is fixed with bolts on the side wall of the housing box, (in other words, on the side wall existing in a lifted state) which is welded and fixed at the opening region of

the side sill. In order to improve the rigidity, therefore, it is required either to increase plate thicknesses of the side sill and housing box or to add reinforcing parts.

However, any of these countermeasures results in an increase of costs and disadvantages in the economic efficiency.

Meanwhile, the sliding door has an arm fixed at the lower part thereof, and a roller supporting member is rotatably mounted onto the said arm by the use of pins.

And, the roller of the roller supporting members is engaged with the lower rail, thereby the slide door is mounted at the side sill.

In the supporting structure of the above-mentioned slide door, the pins are inserted into both roller supporting member and the arm; these are mutually linked by crimping the pin ends. The internal height of the above-mentioned rail-housing box is set to be fixed to the height of both pin length with suitable clearances.

In the supporting structure of such slide door, in order to increase the slide door supporting strength, it is needed to expand the coupling range of the arm and the roller supporting members, that is, to enlarge the pin lengths, and subsequently, the internal height of housing box has to be made taller.

When the internal height of the housing box is made taller, it is required to increase the plate thickness of the housing box to reinforce the housing box, resulting in inconvenience of a passenger for riding in and off due to increased height of the side sill.

And, the rear end of the above-mentioned lower rail is provided with leaf springs for positioning the slide door at its opened state and stoppers for preventing the slide door to be derailed from the lower rail. These leaf springs and stoppers are previously fixed with mounting brackets, and are arranged at the specified positions, by fastening them at the lower rail with screws.

Meanwhile, in the above-mentioned vehicle, long mounting brackets having leaf springs are inserted through the rear end opening of the lower rail and are engaged with the lower rail. Therefore, the assembling work has been made complicated.

## 3. OBJECT AND SUMMARY OF THE INVENTION

The present invention aims at providing a vehicle provided with slide door which having the rails firmly held and protected through further improvement in easiness in riding on and off.

Another object of the present invention is to provide the vehicle provided with slide door whose stopper assembling to rail has been made simplified.

In order to achieve the above-mentioned objects, in the vehicle provided with slid door, the present invention makes a part of the side sill protrud over the upper surface of the rail in a covering manner.

With such structure, the strength of the side sill itself can be reinforced, therefore, the rail can be

firmly supported. In addition, the protruding portion of the side sill protects the rails from rainwater, etc., moreover, the rail does not give inconvenience to a passenger when the passenger rides on and off the vehicle.

The side sill is composed of the lower panel whose lower end region is fastened to the lower part of the floor side panel and whose intermediate region supports the afore-mentioned rail, as well as of the upper panel whose upper end region is fastened to the upper part of the afore-mentioned floor side panel. It is also possible to form a rail cover by overlapping the upper end region of the afore-mentioned lower panel with the lower end region of the afore-mentioned upper panel, by bending the overlapped portions above the afore-mentioned rail, and by mutually fastening the bent up portions.

Furthermore, it is possible to improve the strength of side sill by attaching and fastening a reinforcing plate to the afore-mentioned lower panel and the afore-mentioned upper panel.

And, pertaining to the vehicle provided with slide door of this invention, an opening is formed at the front end portion of the afore-mentioned side sill, and rail housing box is arranged from the opening towards the inside of the side sill, then the top end portion of the afore-mentioned rail is bent and housed into the box, in addition, the top end portion of the afore-mentioned rail, the afore-mentioned rail housing box, and the floor side panel are jointly tied up with bolts and nuts.

In conformity with such structure, the rail is supported not only with the rail housing box but also with the floor side panel, consequently, the supporting intensity increases. Furthermore, the roller is supported with the roller supporting members, and the supporting members are supported with an arm in an oscillatorily free manner by means of a pin, and in the case where the arm is fixed at the afore-mentioned door, it is possible to reduce the height of the housing box by providing a groove to the bottom wall of the housing box along the movable range of the afore-mentioned pin, by facing the lower end of the afore-mentioned pin, and by arranging a roller assembly.

To adopt such structure, the intensity of the housing box can be improved. And, it is possible to reduce the height of the side sill and thereby a passenger can ride on and off more smoothly.

Forther, in the case of the vehicle provided with slide door of the present invention, the rear end of the afore-mentioned rail is opened and possesses a leaf spring inserting hole and a screw driving hole on the upper wall of the rear end region thereof. Moreover, the afore-mentioned rail possesses a leaf spring with a screw driving hole, which is arranged from the afore-mentioned leaf spring inserting hole along the afore-mentioned rail in order to apply brakes to the afore-mentioned door by coming into contact with the afore-mentioned roller, possesses a cover with a screw driving hole, which clogs the leaf spring inserting hole of the afore-mentioned rail, and possesses a mounting bracket with a screw hole at the upper part, to one side of which is provided with a stopper and the stopper is inwardly inserted into

the rear end opening of the afore-mentioned rail.

And, screws are driven through the screw driving holes of the afore-mentioned cover, leaf spring, and rail, engaged with the screw hole of the afore-mentioned mounting bracket, then the afore-mentioned cover, leaf spring, and mounting bracket are tied up to the afore-mentioned rail.

In compliance with such structure, the leaf spring can be installed from above into the lower rail, moreover, screw clamping can be carried out from above the lower rail, therefore, assembly work can be made extremely simplified.

#### 4. BRIEF DESCRIPTION OF THE DRAWINGS

Figure 1 is a side view showing the vehicle provided with slide door in which the present invention is applied, where the figure particularly shows a view of the vehicle body from which the sliding door is removed.

Figure 2 is a perspective view showing the side sill of the vehicle.

Figure 3 is a cross sectional view of the side sill cut off with the line III-III indicating the setting state of the side sill to the rail.

Figure 4 is a cross sectional view showing an example of improving the strength of the side sill shown in Fig.3.

Figure 5 is a cross sectional view of the vehicle in Fig. 1 cut off with the line V-V to illustrate the mounting structure of the rail top end.

Figure 6 is a cross sectional diagonal view of the region in Fig. 5 seen from the direction A.

Figure 7 is a cross sectional view of the vehicle in Fig. 1 cut off with line VII-VII.

Figure 8 is a disassembled diagonal view of the stopper installed to the rear end of the rail.

Figure 9 is a cross sectional view illustrating the state where the stopper is assembled to the rail.

#### 5. DETAILED DESCRIPTION OF PREFERRED EMBODIMENTS

The vehicle shown in Fig. 1 is provided with a roof panel 1, a rear quarter panel 2, a side sill 3, an upper row guiding means 4, an intermediate row guiding means 5 and an upper row guiding means 6, in addition, the upper, intermediate, and lower rows of the door inner panel 8 of the sliding door 7 are installed with the roller assemblies 9, 10, and 11, respectively.

The upper row guiding means 4 has the square-cylindered rail (upper rail) 13 on whose lower face thereof the slit 12 is formed, and the rail 13 is provided from the front end of the roof panel 1 to a place between the center pillar 14 and the rear pillar 15. And, from the center pillar 14 of the roof panel to the rear pillar is provided the garnish (quarter garnish) 16, and the garnish 16 covers a part of the above-mentioned rail 13.

The intermediate guiding means 5 has the square-cylindered rail (center rail) 18 on the side face thereof, the slit 17 is formed. This rail 18 is installed in the center rail housing groove 19 that is formed over

the entire length of the rear quarter panel 2. The garnish (center garnish) 20 is provided for this center rail housing groove 19, and with the garnish 20 covers the area where the rail 18 of the center rail housing groove 19 is not provided.

The lower row guiding means 6 has the square-cylindrical rail (lower rail) 22 on whose side face thereof the slit 21 is formed. This rail 22 is provided over the entire length of the side sill 3, and the stopping means 23 is installed to the rear end of the rail 22.

To describe in details the vehicle structure of this lower row guiding means 6 in accordance with Fig. 2 and Fig. 4, the side sill 3, on which the lower rail 22 is fixed, is composed of the side sill upper panel 24 and the side sill lower panel 25. The side sill upper panel 24 is composed of the flat region 24a, which is welded and fixed to the upper flat region 26a of the floor side panel, and the cover 24b whose end stretches as far as the position to cover the upper region of the lower rail 22 fixed from the flat region 24a. On the other hand, the side sill lower panel 25 is composed of the flat region 25a one of whose ends is welded and fixed to the lower side wall 26b of the floor side panel 26 as well as of the cover 25c which is formed by bending the top end portion of the vertical region 25b. The lower face of the top end of the cover region 24b of the above-mentioned side sill upper panel 24 is welded and fixed to the upper face of the top end of cover region 25c of the side sill lower panel 25 and thereby the floor side panel 26, side sill upper panel 24 and side sill lower panel 25 form a closed cross section, moreover, form the cover 27 which covers the upper region of the lower rail 22. The linear region 22a of the lower rail 22 of the sliding type door 7 is screwed and fixed at the vertical region 25b of the side sill lower panel 25 by means of the bolt 28 and the nut 29. The clamping tool of the nut 29 is inserted from the hole 30 which is provided to the side panel 26, and this hole 30 is covered with the floor carpet 31 which is attached to the vehicle floor. When the more strength is required for the side sill 3, its rigidity is reinforced as shown in Fig. 4 by providing welding fixation to the reinforcing plate 32 between the vertical region 25b of the lower panel 25 and the flat region 24a of the upper panel 24.

The top end of the lower rail 22 is formed in a bent manner inside the side sill 3 in order to close the slide door 7 as shown in Fig. 5. Therefore, the opening 33 is formed at the side sill 3 so that the top-end bent region 22b of the lower rail can come in. The housing box 34 is welded and fixed to the side sill opening region 33 in order to house and support the top end bent region 22b of the lower rail and to prevent rainwater, etc., from penetrating the side sill 3.

The bearing surface 35, which is concaved in the mounting position of the top-end bent region 22b of the lower rail, is formed at the floor side panel 26. This bearing surface 35 is configurated so that it comes in contact with the rear surface of the side wall of housing box 34 and in that region the side floor panel 26, housing box 34 and the top-end bent region 22b of the lower rail are jointly fastened by

means of the above-mentioned mounting bolts 36 and the nut 37.

On the other hand, with respect to the upper row roller assembly 9 of this vehicle, the roller 38 is installed to the arm 39, and the arm 39 is fixed to the door inner panel 8.

And, with respect to the intermediate row roller assembly 10, the roller 41 is fixed at the door inner panel 8 via the roller supporting member 40. Furthermore, with respect to the lower row roller assembly 11, as shown in Fig. 5 and Fig. 7, the arm 42 is fixed to the door inner panel 8, and to the arm 42 is connected with the roller supporting member 44 by means of pin 43. And, both the main roller 45 and the subroller 46 are provided to the roller supporting member 46.

Respective rollers 38, 41, 45 and 46 of the above-mentioned roller assemblies 9, 10 and 11 configurated thus are inserted into the rails 13, 18 and 22 of respective guiding means 4, 5 and 6, thereby the sliding door 7 is supported at the car body. Then, at the front end region of the lower row guiding means 6, as shown in Fig. 7, the groove 34b is formed along the moving range of the above-mentioned pin 43 on the bottom wall 34a of the housing box 34. The clearance between the upper end of pin 43 and the ceiling wall 34c of the housing box 34 is secured by housing the lower end of pin 43 in the groove 43b.

This stopper means 23 has, as shown in Fig. 8, both the leaf spring 47 and the stopper 48. The leaf spring 47 is fixed to the rear surface of the cover 49 by either welding or adhesive, etc. The stopper 48 is formed with cushion material and the stopper 48 is fastened to the mounting bracket 50 by means of adhesive or the like. On the other hand, the hole 51 having a length corresponding to the above-mentioned leaf spring 47 is formed on the rear, upper wall of the rail 22.

And, this stopper means 23, after engaging respective roller assemblies 9, 10 and 11 with the respective rails 13, 18 and 22 of the side rail, makes the leaf spring 47 face inside the rail 22 through the hole 51 of the rail 22, in addition, it covers the hole 51 by means of the cover 49, and makes the stopper 48 inside the rail 22 to engage the mounting bracket 50 with the end surface opening of the rail 22. Next, the stopper means inserts the screw 52 into the formed holes of 49a, 47a and 22c at the cover 49, leaf spring 47 and the rail 22 and are assembled by screwing the screw 52 into the screw hole 50a of the mounting bracket 50.

Fig. 9 shows the geometrical relationship between the stopper means 23 thus assembled and the roll assembly 11.

The rollers 45 and 46 are rolled inside the rail 22 and when the roller 45 reaches a terminal end of the rail 22, the roller 46 comes into contact with the leaf spring 47 and is positioned there by energized force of the leaf spring. In the event that the sliding door 7 is opened vigorously and subsequently the roller 46 does not stop at the leaf spring 47, the roller supporting member 44 bumps against the stopper 48 and is stopped with the said stopper 48.

And, in the case of the above-mentioned example,

the leaf spring 47 and the cover 49 are formed separately and they are weld d together. It is also possibl integrally, to form the leaf spring 47 and the cover 49.

### Claims

1. A vehicle provided with a slide door, comprising:  
a side sill provided with a square cylindrical rail having a slit extending to the longitudinal direction of the side portion and a roller being engaged with said rail at a door to allow said door to be closed backwardly along a side body,  
wherein said side sill has a part projected for covering the upper phase of said rail to form a rail cover.
2. The vehicle provided with the slide door according to claim 1, wherein said side sill has the lower end portion fixed with the lower part of a floor side panel, the intermediate portion fixed with a lower panel, and the upper end portion provided with an upper panel fixed with the upper portion of said floor side panel, and the upper end portion of said lower panel and the lower end portion of said upper panel are superposed and bent at the upper portion of said rail and fixed with each other at the bent portion to form said rail cover.
3. The vehicle provided with the slide door according to claim 2, wherein a reinforce plate is fixed across said lower panel and said upper panel.
4. A vehicle provided with a slide door, comprising:  
a side sill provided with a square cylindrical rail having a slit extending to the longitudinal direction of the side portion and a roller being engaged with said rail at a door to allow said door to be closed backwardly along a side body,  
wherein said side sill has an opening at its front side end, and a rail housing box is provided from said opening to the inner portion of said side sill for housing an edge portion of said rail to be bent, and the front end portion of said rail, said rail housing box and a floor side panel are fastened by means of a bolt and a nut.
5. The vehicle provided with the slide door according to claim 4, wherein said roller is supported by a roller support member, said support member is rotatably provided with an arm through a pin, said arm is fixed with said door, said housing box has a groove formed along a movement region of said pin in its bottom wall, and a roller assembly is provided to be facing in said groove.
6. A vehicle provided with a slide door, comprising:  
a side sill provided with a square cylindrical rail having a slit extending to the longitudinal direction of the side portion and a roller being engaged with said rail at a door to allow said

door to be closed backwardly along a sid body,  
wherein said rail is provided with an opening in its back end portion and a l af spring insertion hole, and a screw through hole on the upper wall of its back end portion, a leaf spring arranged to face in said rail from said screw through hole and said leaf spring insertion hole to give a braking to said door by contacting with said roller, a cover for covering said leaf spring insertion hole of said rail provided with a screw through hole, a mount fitting having a screw hole in its upper portion and a stopper in its one phase to allow said stopper to be inserted into the back end opening of said rail to the inner portion, and a pin being inserted through said screw insertion hole of said cover, said leaf spring and said rail to be engaged with said screw hole of said mount fitting to allow said cover, said leaf spring and said mount fitting to be fixed with said rail.

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FIG. 1

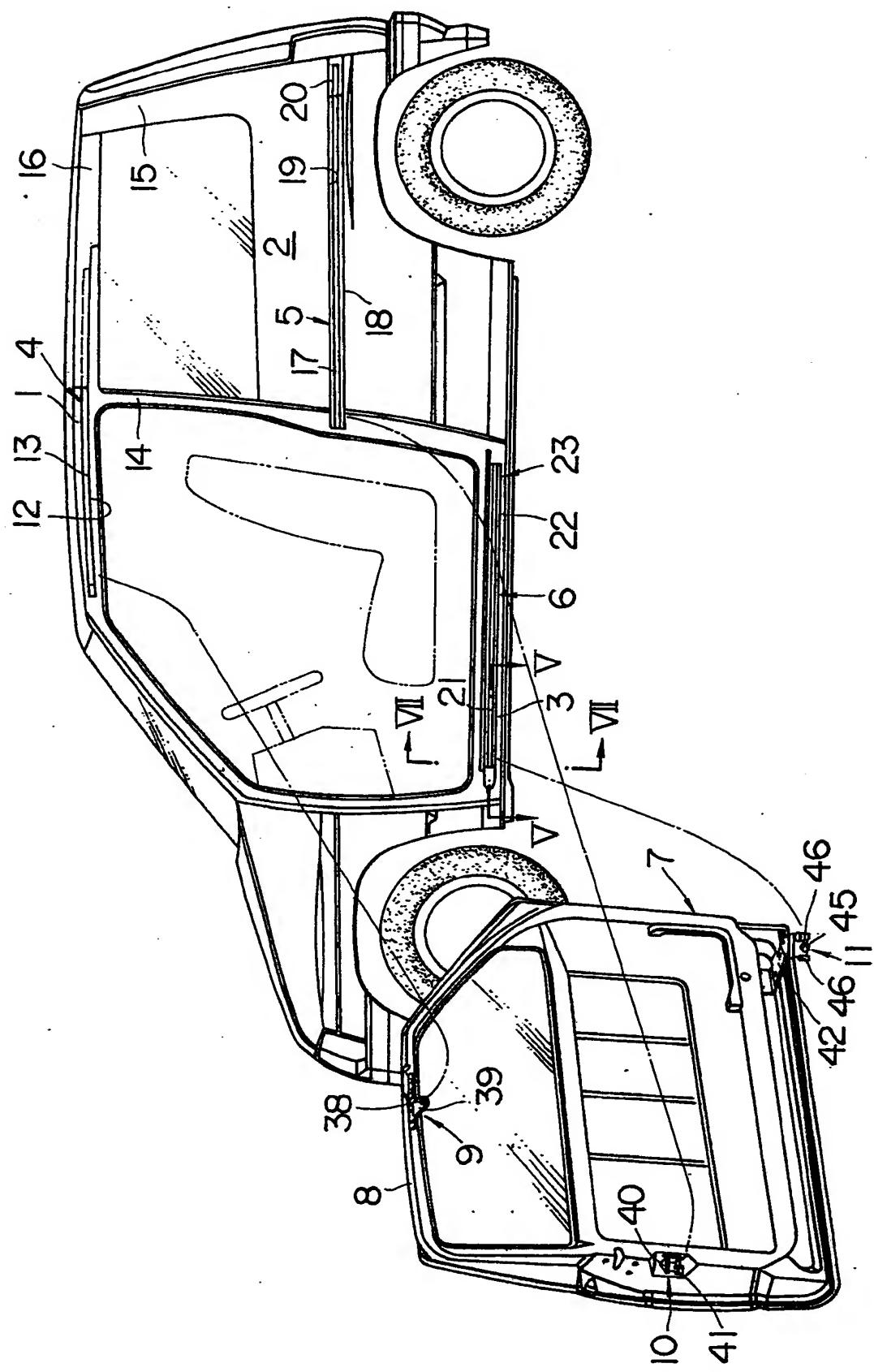


FIG. 2

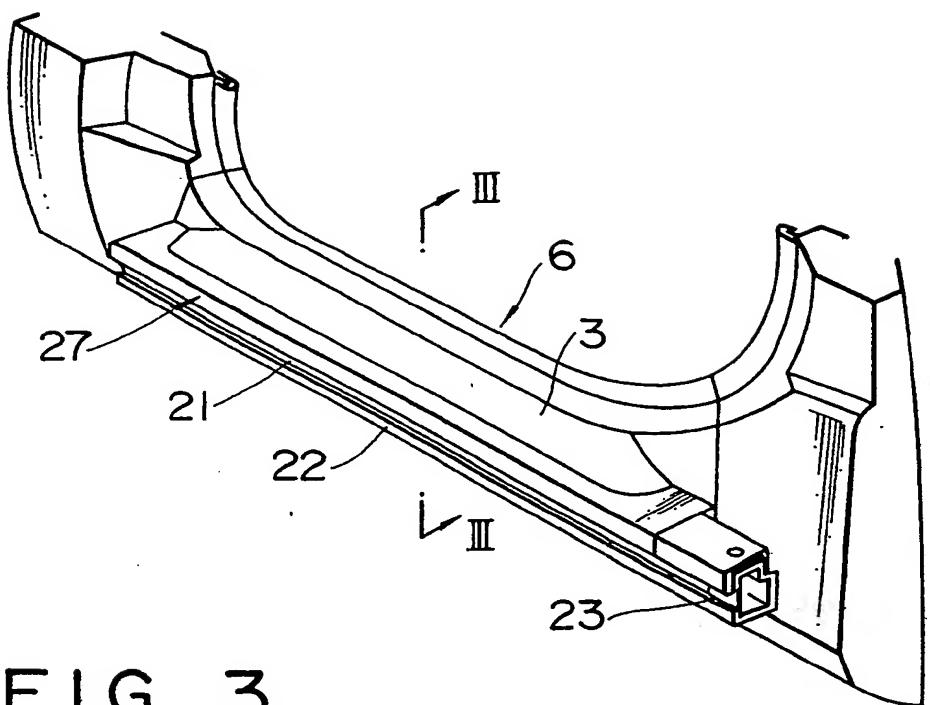


FIG. 3

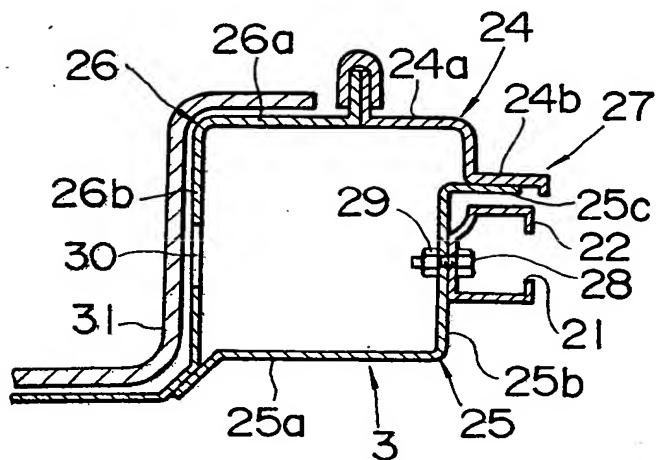


FIG. 4

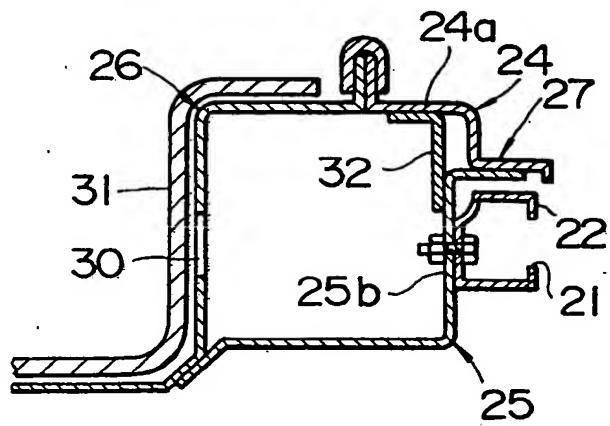


FIG. 5

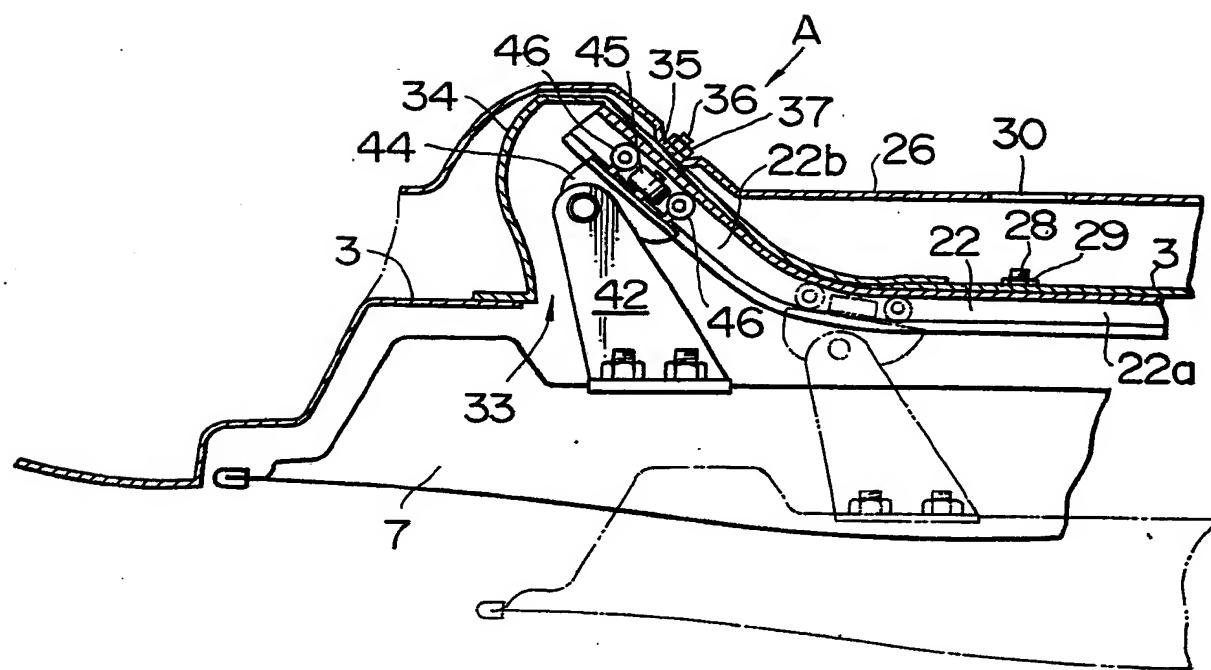


FIG. 6

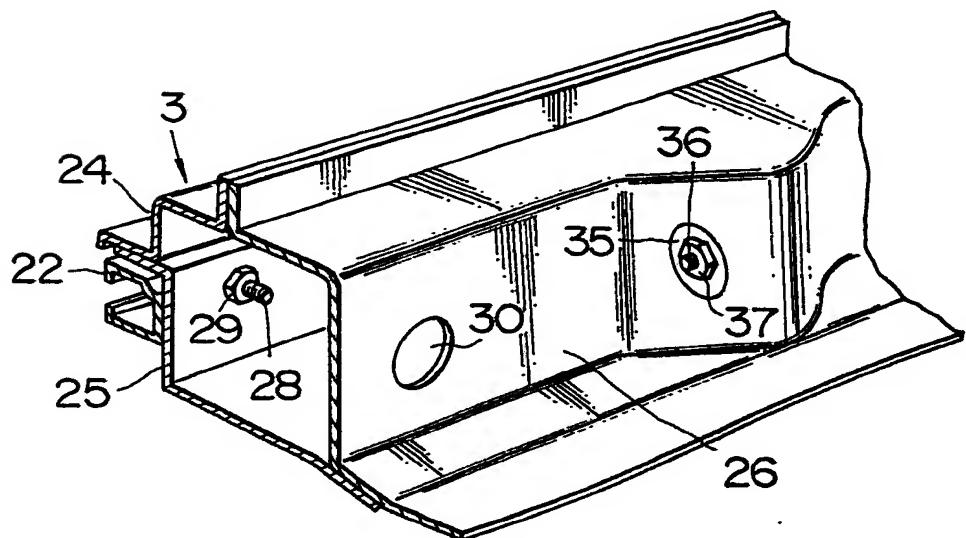


FIG. 7

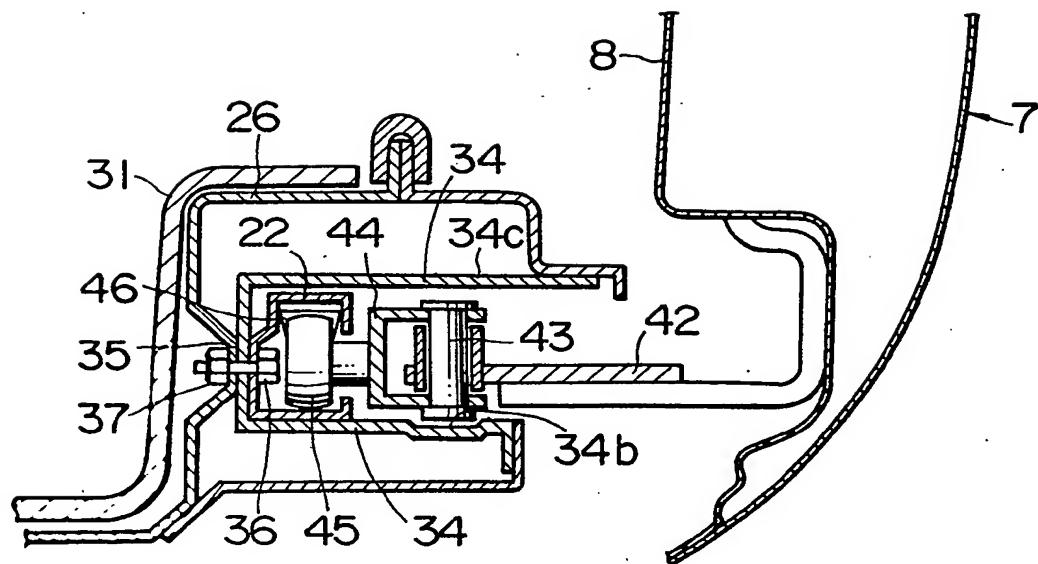


FIG. 9

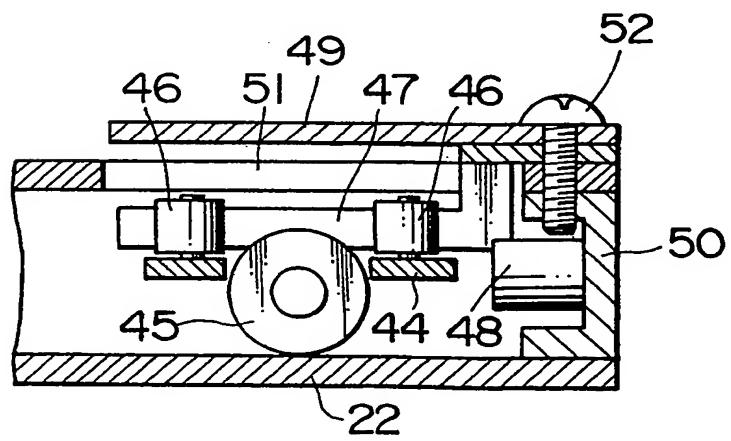
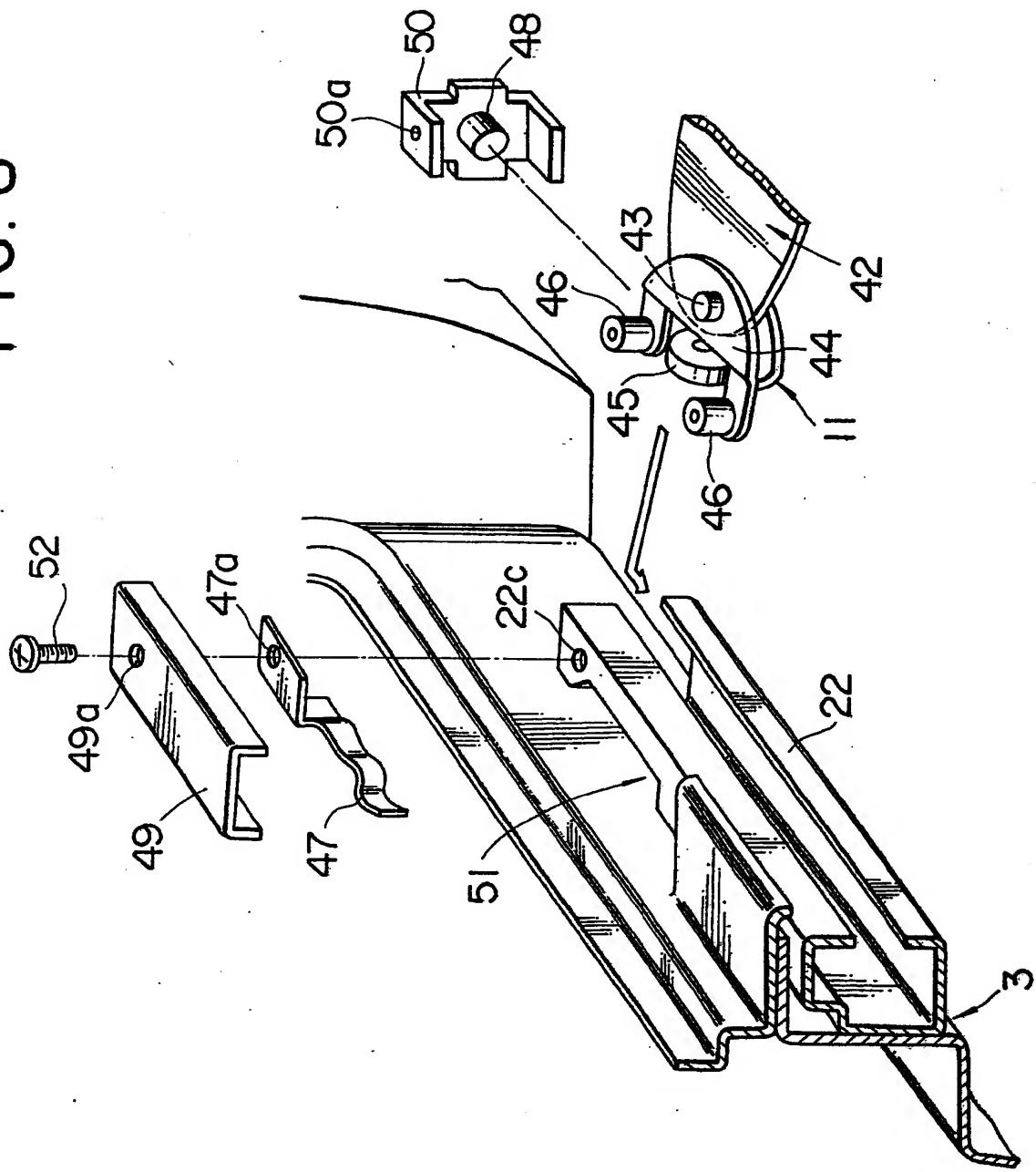


FIG. 8





EP 89 73 0186

DOCUMENTS CONSIDERED TO BE RELEVANT

| Category | Citation of document with indication, where appropriate, of relevant passages   | Relevant to claim | CLASSIFICATION OF THE APPLICATION (Int. Cl. 5) |
|----------|---|-------------------|--|
| Y        | GB-A-2 126 173 (NISSAN MOTOR CO.)<br>* Page 2, lines 101-113; figures 4,8;<br>page 3, lines 40-66; figure 9; page 4,<br>lines 1-3 * | 1                 | E 05 D 15/10<br>B 60 J 5/06                    |
| A        |   | 2, 3, 5           |  |
| X        | ---   | 4                 |  |
| Y        | FR-A-1 548 510 (SIMCA S.A.)<br>* Figure 6 *   | 1                 |  |
| A        | EP-A-0 100 455 (NISSAN MOTOR CO.)<br>* Page 6, lines 18-27; page 27, lines<br>1-9; figure 6 *                                       | 3                 |  |
| A        | US-A-2 656 215 (HARVEY)<br>* Page 5, lines 52-60; page 6, lines<br>56-59; figure 7 *  | 6                 |  |
| A        | GB-A-2 125 887 (FIAT)<br>* Claim 1 *  | 6                 |  |
|          | -----   |                   |  |
|          |   |                   | TECHNICAL FIELDS<br>SEARCHED (Int. Cls)        |
|          |   |                   | E 05 D<br>B 60 J                               |

The present search report has been drawn up for all claims

| Place of search  | Date of completion of the search | Examiner  |
|--|----------------------------------|---|
| THE HAGUE  | 25-10-1989                       | GUILLAUME G.E.P.  |
| <b>CATEGORY OF CITED DOCUMENTS</b>   |                                  |   |
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